NOTES ON THE AUSTRALIAN RUTELINAE (SCARABAEIDAE, COLEOPTERA).

SUPPRESSION OF A GENERIC NAME UNDER CLILOPOCHA LEA.

By P. B. Carne.*

[Read 25th May, 1955.]

Synopsis.

Dynastomorphus Carne (1954) is shown to be a synonym of the monotypic genus *Clilopocha* Lea (1914): the latter was erroneously placed by its author in the subfamily Melolonthinae. With a slight modification the generic characterization of *Dynastomorphus* is applicable to *Clilopocha* Lea, which now consists of the following species: *C. whiteae* Lea (type species), *C. pilosicollis* (Lea), n. comb., *C. pachypus* (Lea), n. comb., *C. angularis* (Carne), n. comb., *C. mandibularis* (Carne), n. comb.

The generic name *Dynastomorphus* Carne was proposed for four species of dynastine-like Ruteline beetles, two of which were described by Lea in the Dynastine genus *Aneurystypus*.

Mr. E. B. Britton of the British Museum has sent the writer a specimen of *Clilopocha whiteae* Lea with the comment that he could not accept it as a Melolonthine. Lea erected this monotypic genus and considered it most closely related to *Dysphanochila* Blackb. in the Melolonthinae. The species is, however, a typical *Dynastomorphus*, closely related to *angularis* Carne.

The name *Dynastomorphus* must therefore be placed in synonymy under *Clilopocha* Lea.

Clilopocha Lea.

Clilopocha Lea, *Trans. Roy. Soc. S. Aust.*, XXXVIII, 1914: 452.—*Dynastomorphus* Carne, *Proc. Roy. Ent. Soc.* (B), 23, 1954: 36 (SYN. N.).

Type species: *Clilopocha whiteae* Lea, 1914.

The addition of a fifth species to this assemblage requires no modification of the generic characterization published for *Dynastomorphus* beyond the deletion of the phrase "anterolateral angles obtuse" in reference to characters of the pronotum.

From *mandibularis* Carne, *whiteae* differs in its cephalic profile (which is almost identical with that of *angularis* Carne) and in its lack of decumbent pygidial setae. From *angularis* it differs in having the clypeus strongly punctate, the elytra without conspicuous striae but with dorsal vestiture. From both species it differs in having the mandibles only slightly produced beyond the clypeus and in having elytra with conspicuously membranous lateral margins. From Lea's species, *pachypus* and *pilosicollis*, it differs in its coarsely tridentate fore tibiae bearing evident spurs, in its highly transverse clypeus and its anteriorly arcuate clypeofrontal[1] suture.

C. whiteae is known only from three type specimens in the South Australian Museum; all were taken in the MacDonnell Ranges by Capt. S. A. White.

The following new combinations are to be noted: *Clilopocha pachypus* (Lea); *Clilopocha pilosicollis* (Lea); *Clilopocha angularis* (Carne); *Clilopocha mandibularis* (Carne).

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AUSTRALIAN RUST STUDIES. XIV.

Investigations of Rust of Maize caused by Puccinia sorghi Schw.

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(Plate v.)

[Read 25th May, 1955.]

Synopsis.

Five aecidial and seven uredospore cultures of *Puccinia sorghi* Schw. from New South Wales and Queensland were used in a comparative study of the reactions shown by strains of inbred maize from N.S.W., Queensland, and U.S.A. No evidence of specialization was shown, all inbreds showing seedling susceptibility; there was evidence that mature plant resistance sometimes occurs. An inbred maize from Minnesota, U.S.A., named "Golden Glow 208" was resistant to all cultures. It was crossed with an inbred strain of "Funk's Yellow Dent", and gave F_1 and F_2 evidence of its resistance being due to a single dominant gene which is inherited independently of the dominant gene in "Funk's Yellow Dent" for coloured coleoptile.

Introduction.

Rust on maize caused by *Puccinia sorghi* Schw. has been known in Australia since 1890 (Noble *et al.*, 1934), and in favourable seasons does serious damage to the foliage and thus reduces the yield. This has become increasingly noticeable with the greater popularity of sweet corn in horticultural practice, where environmental conditions are generally more favourable for rust development than under field conditions.

The Pathogen.

Until 1946 only the uredo- and teleutospore stages of the fungus had been recorded. In that year, viable teleutospores sent from Glen Innes on maize trash that had been exposed to the severe winter conditions of the Tablelands were used to inoculate plants of *Oxalis corniculata* L. growing in pots in the plant house. Abundant production of spermogonia and aecidia followed, and from the latter, cultures on seedling maize plants were developed and maintained in the plant house. It was found that this uredospore material, if air-dried in the laboratory, and kept in a refrigerator at ± 3° C., remained viable for several months.

Following upon this production of the aecidial stage, a search was made for it under natural conditions in the field. It was found at Manly in the Sydney metropolitan area, Bega, Grafton, and Glen Innes: in all cases the alternate host was growing as a weed in areas in which maize had been cultivated. In all cases uredo-cultures were developed and maintained in the plant house on maize seedlings.

Specialization.

The occurrence of physiologic races of the rust has been recorded in U.S.A. Stakman *et al.* (1928) found 7 races, and Mains (1931) determined 3 races by the use of a different set of differentials. Their host material has not been available for use here.

For the local studies the following cultures were used: *Aecidial cultures* from Manly (2), Bega, Grafton, Glen Innes. *Uredo-cultures* from Manly, Bega, Grafton, Glen Innes, Hermitage Q., Toowoomba Q., and Ayr Q.

Cultures were maintained on seedlings of the maize variety "Funk's Yellow Dent", kindly supplied by the N.S.W. Department of Agriculture. The inoculum was built up into quantities sufficient for inoculation work as required. From time to time albino seedlings showed up in the pots (Plate v, A). Seedlings growing in 4-inch pots in the

plant house were used throughout the work: the leaves were moistened, the uredospores transferred to them with a sterile scalpel, and the pots then incubated for a period of 36–48 hours, depending upon the weather, and afterwards kept on well-lighted benches in the plant house until the reactions were fully developed. No differences in reactions owing to high or low temperatures were noted.

In note-taking the separation into resistant and susceptible plants gave no trouble (Plate v, B), but the following notation was used:

0; = Resistance: tiny scattered flecks on leaves.
1 = Resistance: very small pustules on necrotic spots.
X–= Resistance: a mixture of flecks with very small and rather large pustules on necrotic areas.
4 = Susceptibility: abundant production of uredo-pustules without necrosis, often coalescing to form large lesions.

Host material for the tests was kindly supplied in 1947 by Mr. W. W. Bryan of the Queensland Department of Agriculture, and by Mr. W. T. Atkinson of the N.S.W. Department of Agriculture; later, at the request of Dr. E. P. Baker, Dr. H. K. Hayes of the University of Minnesota forwarded a selection of his material.

The Queensland inbreds were as follows, in which the first numeral is the Gatton Accession Number:

144 U.S.D.A. Line X, 263 Wisconsin 7945, 269 Wisconsin A1237, 270 Wisconsin R4, 272 Wisconsin I90, 275 Wisconsin 132, 294 Missouri K1, 295 Missouri H3, 296 Missouri N12, 317 Minnesota 11, 326 Nebraska 365–2046A, 327 Nebraska Wahl 2010A, 328 Nebraska 111-2066A, 332 Iowa L317B2, 346 Indiana 54, 347 Indiana 66, 348 Indiana T.R., 376 Wisconsin CR11, 378 Wisconsin B10, 447 Kansas Y.S.50, 579 Wisconsin 32, 637 Iowa B111S, 752 Colorado A–1 Argentina, 811 E.W. Iowa 8273–2.

The N.S.W. inbreds were:

701, Tr, A, I205, 4–8, 187–2, HY2, L317, 38–11, W19, K4, R4, 5120, 2 (selfed), 21 (selfed), 25 (selfed), 25 × 21, D07 (selfed), D07 × 21, 61 (selfed), R.H96A.

The seedling tests with the Australian inbreds in every case revealed a susceptible reaction similar to that shown by the "Funk's Yellow Dent" control. No differences were found between the cultures.

This is at variance with the reported field behaviour of certain of the lines. For example, the N.S.W. inbreds 701 and 5120 were stated by Mr. W. T. Atkinson to have a high tolerance or useful resistance to the rust at Glen Innes (personal communication, 1948). Seeing that both aecidial and uredo-cultures from Glen Innes were used (the latter isolated in 1947), it seems likely that there is no correlation in these cases between seedling and mature plant behaviour to rust attack. Such development of mature plant resistance is well established in certain of the cereal rusts.

The U.S.A. material comprised a number of inbred lines, including one of pod corn (*Zea mays tunicata*). All proved susceptible, with the exception of "Golden Glow 208", which was resistant throughout. Three strains of teosinte (*Euchlaena mexicana* Schrad.) proved strongly resistant to all the cultures with the exception of the Glen Innes aecidial culture, which produced a susceptible reaction on one of the strains. This was the only indication of a differential reaction in all the tests.

Crossing Work.

The resistant "Golden Glow 208" was crossed in the plant house in 1949 and 1950 with an inbred selection of "Funk's Yellow Dent". This had its origin in a chimeric cob collected in the Moruya District by Dr. N. H. Parbery (Plate v, C). Its progeny were susceptible in all subsequent seedling tests. Grain from the deep red sector on the cob gave plants which bred true for this deep colour, whilst 2 from the border which were partly red and partly yellow produced normal "Funk's Yellow Dent" grain.

The F1 seedlings gave a resistant reaction recorded as "X–". Their cobs, produced in pots in the plant house, were stunted but gave sufficient grain for F2 tests.

The F2 results from 5 cobs tested with the Hermitage culture are set out in Table 1, together with the expected results on a 3:1 basis.

TABLE 1.

Numbers of Plants in Different Classes from Tests of F_2 Seedlings of "Funk's Yellow Dent" × "Golden Glow 208".

Cob.	Observed.		Expected.	
	Resistant.	Susceptible.	Resistant.	Susceptible.
A	42	14	42	14
B	49	14	47·25	15·75
C	31	12	32·25	10·75
D	26	11	27·75	9·25
E	107	42	111·75	37·25
Totals ..	255	93	261	87

$P = > 0{\cdot}30$.

It is clear that a single dominant factor determines resistance in the seedling stage. This is in accord with the U.S.A. determinations (Mains, 1931).

The seedlings of "Funk's Yellow Dent" show pigmentation of the coleoptile, whilst those of "Golden Glow 208" are white. The F1 seedlings were coloured, and in the F2, segregation into the two colour classes was observed.

The progeny of one cob were classified on the basis of coleoptile colour and rust reactions, and gave results as shown in Table 2.

TABLE 2.

Numbers of Individuals Falling into the Different Classes, together with the Expectancy on a 9 : 3 : 3 : 1 Basis.

Class.	Observed.	Expected.
Resistant, coloured	59	65·81
Resistant, white	25	21·94
Susceptible, coloured	23	21·94
Susceptible, white	10	7·31
Totals	117	117

$P = > 0{\cdot}50$.

It is clear that the two characters are inherited independently. Mains (1931) did not detect linkage with any of the characters studied.

CONCLUSION.

The demonstration of the absence of specialization and the simple inheritance of rust resistance would indicate that little difficulty should be experienced in breeding resistant commercial types of maize. "Golden Glow 208" itself may be found to be a suitable inbred for crossing with particular inbreds to produce "hybrid corn". No attempt was made to determine its combining ability.

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